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ABSTRACT

As a preschool screening instrument, the Preschool Preposition Test (PPT) can play an important role in the early identification of cognitive delay. PPT scores increase appropriately with chronological age. Cognitive data demonstrate impressive correlations with recognized intelligence tests (the Stanford-Binet and the Peabody Picture Vocabulary Test), and it correlates well with teachers' ratings of classroom performance. It has concurrent validity as a test of receptive language ability and predictive validity in areas designated as Verbal, Nonverbal and Quantitative Abilities on a test of cognitive abilities. The long term predictive power demonstrated in a third grade follow-up study of students from 10 Head Start classes is considered strong and unexpected in so brief and simple a screening tool. A possible link between PPT scores and the mother's nurturant and verbal behavior with her child is indicated from reports of parent-child relationships in three home-based intervention studies. Based on the investigation of five Head Start programs and one third grade follow-up study, it is concluded that administering the PPT a few weeks after the beginning of the school year provides useful identifying information about students likely to encounter scholastic difficulties. The PPT can be administered quickly by classroom staff or volunteers. Children earning the poorest scores should be assessed further to determine the underlying causes. Special needs can then be met early in the preschool year, helping students to overcome emerging difficulties which could develop into scholastically handicapping conditions. (Author/GDC)

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## ABSTRACT

# Preschool Preposition Test: Developmental Screening for Head Start

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The Preschool Preposition Test (PPT), a rapid screening test, was used with children in Head Start programs to identify those needing early scholastic assistance. The PPT is a quick, game-like, receptive language test for children ages 3 to 5, with validity and reliability data involving over 1400 children. Its long range predictive power is supported by impressive correlations between Head Start PPT scores and scores of mental ability and scholastic achievement five years later. Data point to a linkage between PPT scores and maternal nurturant and verbal behavior with the child.

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# PRESCHOOL PREPOSITION TEST: DEVELOPMENTAL SCREENING FOR HEAD START

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The Preschool Preposition Test (Aaronson & Schaefer, Note 1) is a quick, game-like individual test for children ages three to five which can play an important role in the early identification of delay in cognitive development. Its validity and reliability have been demonstrated in previous studies. Reported here are the results of testing 299 Head Start children in five programs in four different states. Additionally, the long-term predictive validity of the Preschool Preposition Test (PPT) is supported by scores on mental ability and achievement tests earned by third grade students who had been tested on the PPT in Head Start five years earlier. Evidence of a possible link between PPT scores and the mother's nurturant and verbal behavior with her child (Aaronson & Phillips, 1977) will also be of interest to Head Start programs.

This report is especially concerned with the use of the PPT by children in Head Start classes because Head Start is the largest federally supported nation-wide preschool program in the country at the present time. The program was initiated in 1965 to help break the cycle of poverty by strengthening children's ability to cope with school and social demands (Head Start, 1977). If there

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For obtaining much of the Head Start data, we thank Sara Derrick, Alfred and Bernice Glixman, and Leslie L. Montie. The Maryland Head Start and third grade follow-up data were obtained by Charles Wiles, Samuel Goodman, Daniel Solomon and Roberta Keiter. Earl Schaefer and Phyllis Levenstein provided the PPT data related to parent-child interactions. We thank Judith Goldstein for help with preparation of the statistical tables and the manuscript.

were an easy and inexpensive way for classroom staff or volunteers to screen large numbers of children to help identify delay in cognitive development, earlier and perhaps more effective assistance could be provided to overcome emerging scholastically handicapping conditions. The PPT, still in research, promises to be just such a screening tool.

Over the past 10 years, the PPT has been used experimentally as a developmental screening instrument for children ages three to five. A substantial amount of evidence shows the PPT to be valid and reliable with normal children and also with special populations including those with delayed language development or behavioral difficulties, and older disadvantaged or mentally retarded children (Aaronson & Phillips, 1977; Aaronson & Rosenfeld, 1973, Aaronson & Schaefer, 1971; Borich & Madden, 1977; Day & Parker, 1977; It Works, 1969; O'Connel, Terrill & Brash-Sorensen, 1974). Its development was based on Bayley's study of the Berkeley Growth Study data (N. Bayley, personal communication, 1967) in which she found that knowledge of prepositions correlated with verbal and spatial abilities in the early years. Later, others working with the same data (McCall, Eichorn, & Hogarty, 1977) found that knowledge of a few prepositions at 27 to 30 months correlated with IQ scores at six to 36 years of age. Miller and Johnson-Laird (1976), in a review of research related to prepositions and other spatial locatives, describe spatial prepositions as cognitively and grammatically very complex, belonging to a category of spatial language used primarily to indicate where things are. Even adults, they say, have difficulty with some spatial terms. According to Piaget (Gruber & Voneche, 1977), verbal directions (such as those in the PPT) generate in the child sensorimotor activity and perceptual discrimination which are precursors to comprehension of spatial concepts.

## Description of Test

The PPT is a receptive language test which examines the comprehension of verbal directions using spatial prepositions or prepositional phrases together with objects. Each child is tested individually in about five minutes. Classroom staff, paraprofessionals or volunteers can handle an entire testing program. Because children find the test materials appealing, gaining their cooperation poses few if any problems. To the child, the test materials are seen as an attractive toy. Examiners, too, report they enjoy working with the materials (S. Stecher, personal communication, March 2, 1978).

To administer the test, the examiner hands the child a red, 1-1/2" diameter, half-ball that is covered with a magnetic material on the flat side. The examiner directs the child to make placements with the ball onto an illustrated metal board placed upright in front of him. The board is painted with a picture of a red boy facing a green car on a yellow background. The examiner reads aloud 23 items in turn, each containing a preposition or prepositional phrase; for example, "Put the ball <u>into</u> the boy's hands," "Put the ball <u>in back of</u> the car." In response, the child places the magnetized ball onto the board, where it adheres. The examiner then marks the child's placement with an X and an item number on a Picture Score Sheet, a reduced-size replica of the testing board picture. With the use of the Picture Score Sheet, the actual scoring can be done later by the tester or someone else, carefully and accurately without the pressures and distraction of the testing session, and may be double-checked by others if desired. A separate scorer removes the "halo effect" or possible tester bias in scoring. The permanent record permits review of the kinds of errors being made by a particular group of children. To help with the interpretation of scores, percentile norms by age are available, based on almost 1,000

subjects. Children are not tested unless English is their native language. A more complete description of the test and testing materials is available elsewhere (Aaronson & Phillips, 1977; Aaronson & Schaefer, Note 1).

## Subjects and Measures

The PPT has been administered to over 1400 children, ages 24 to 84 months, and to older mentally retarded children and youths. Included are children in Head Start groups—the basis for this report—and children in day care centers, preschools, elementary schools, home-based intervention programs, and Early and Periodic Screening, Diagnosis and Treatment Programs (Medicaid, 1974). This report will consider in detail the results of testing programs for almost 300 Head Start children, ages 30 to 68 months, from five samples representing urban, suburban, rural, black and white, lower and middle-class populations, from one eastern and three mid-western states, administered by both black and white examiners (Table 1). The Maryland groups listed as Subsamples 1 and 2, Table 1,

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Insert Table 1 about here

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together formed a single testing program which included 10 Head Start classes located in six elementary school buildings, a total of 118 children. Subsample 2, however, is treated separately and referred to as a "special subgroup" because it was studied more intensively than the remainder of the sample. It consists of four classes in one school building (N=37) and was selected for further study because it was considered most representative of the greater sample as to geographical location, socio-economic status and home environments of the children.

For comparison with the PPT, most of the Head Start groups, and the third grade follow-up study, had children's scores on one or more additional evaluative

tests, including the Stanford-Binet (S-B), Peabody Picture Vocabulary Test (PPVT), ABC Inventory (Adair & Blesch, 1971), the Classroom Behavior Description (Aaronson & Schaefer, Note 2), the Cognitive Abilities Test (Thorndike & Hagen, 1971), and the Iowa Tests of Basic Skills (Hieronymous & Lindquist, 1971).

## Results

### Age-Related Criteria

It is important that a test of cognitive ability reflect the increase in mental development expected with increasing chronological age. Most preschool tests, including the S-B, have employed such evidence in their validation information (Anastasi, 1961). The PPT performs well in this respect.

For 985 normal children (Excluded are institutionalized, homeless children, moderately and severely emotionally disturbed, and mentally retarded children), ranging in age from 23 to 90 months in 14 different samples, a correlation coefficient of .63 ($p < .001$) was obtained between Total PPT Scores and Age in Months. Sex differences by age are negligible, tilting slightly in favor of girls up to 42 months of age. There is a more pronounced difference, however, with social class. Upper middle-class white urban samples (N=158) demonstrate better scores at each six-month age grouping and attain near perfect scores at earlier ages than a lower-class white rural sample (N=294), reported by Aaronson and Phillips (1977). Measures of skewness and kurtosis, or peakedness (Table 2), show that the distribution of scores for a given age is approximately normal up

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Insert Table 2 about here

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to 53 months of age. Above that age, increases of scores with age diminish because of the low ceiling on the test. Another way of stating this is that as

the children grow older a certain proportion of the population comprehends most or all of the items on the test; and due to the lack of more difficult items, scores begin to pile up at or close to 23, the highest possible score. In this respect, it is important to note that, even when this topping out takes place, it does not interfere with the test's screening utility. At these older ages, the PPT continues to identify reliably the low scorers who may be in need of special assistance.

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Insert Table 3 about here

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For the pooled data of the five Head Start samples reported in this paper, we replicated our previous findings of a significant progression of scores with age (Table 3). However, when comparing PPT scores of the pooled Head Start data with pooled non-Head Start samples (Figure 1), scores for Head Start children lag behind in every six month age interval, averaging 2.84 points lower, of a possible 23 points, for all ages combined. These data are consistent with our earlier findings of differences by social class.

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Insert Figure 1 about here

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We examined pre- and post- school year age data for the only Head Start group having this information. For four (of 10) Maryland Head Start classes, which comprise what we will continue to refer to as a "special subgroup" because we studied them more intensively, 37 children were tested a few weeks after the beginning of the school year and again near the end. The group progressed from a mean of 15.30 to 17.78 PPT points, or a total of 2.48 PPT score points ($p < .0001$, Hotelling's $T^2$ Test) over the eight month interval. Because this increase reflects, in addition to increased age, the effects of the Head Start training, we cannot reliably state what portion is attributable to age alone.

Cognitive Data

Strong correlations between a new test and similar older tests can be considered as evidence that the new test measures approximately the same kind of behavior as the others. This holds true for "intelligence" tests (Anastasi, 1961). The PPT correlates well with recognized IQ and general ability tests and can offer an advantage in cases where a rapid, inexpensive, easy to administer assessment of the child's level of cognitive development is needed.

Comparison of the PPT and PPVT. A major emphasis has been placed on comparison of PPT scores with those of the PPVT since they are both multiple choice receptive language tests in which the child makes a non-verbal "placing" or "pointing" response to a simple directive. An important difference is that the PPT items are based on prepositions - abstractions associated with space relations - whereas the preschool PPVT items are based on concrete nouns or action verbs. The PPVT is a widely accepted language developmental test with much validity and reliability data. For 122 subjects who were administered both the PPT and the PPVT, correlation coefficients of .72 (PPVT Raw Score), .69 (PPVT M.A.), and .30 (PPVT IQ) were obtained, all statistically significant ($p < .005$). As the PPT has only raw scores, the most logical score on which to base comparison between the two tests, the raw score, also provides the strongest correlation coefficient, .72 (Aaronson & Phillips, 1977). In the combined Head Start samples (Table 3) a subset of 106 children was administered both the PPT and the PPVT. Again statistically significant correlation coefficients were obtained between the two tests ($p < .01$) as follows: .55 (PPVT Raw Score), .53 (PPVT M.A.) and .51 (PPVT IQ). For 65 Head Start children in the Ohio sample, the PPT correlated .47 (PPVT Raw Score) and .41 (PPVT IQ), both significant at the .001 level (Table 4). For 41 Head Start Start children in our Maryland special subgroup the PPT and PPVT attained

correlation coefficients of .68 (PPVT Raw Score), .67 (PPVT M.A.), and .65 (PPVT IQ).

Insert Table 4 about here

all highly significant (Table 5). It should be noted that correlation coefficients for the PPT and the PPVT with the Stanford-Binet are rather similar, as described below.

Insert Table 5 about here

Comparison of PPT with PPVT and S-B IQ Scores. Two home-based intervention research projects, one in Washington, D.C. and the other in Freeport, N.Y. administered a battery of tests to their subjects which included the PPT, the PPVT, and the S-B. For the Washington, D.C. project Experimental group (N=29), the PPT and the PPVT correlated with the S-B .60 ($p < .001$) and .56 ($p < .005$) respectively; for the Control group (N=30) the correlation coefficients for the PPT and PPVT were .52 and .55 respectively, both $p < .005$. For the Freeport, N.Y. project Experimental group (N=26), the PPT and the PPVT correlated with the S-B .74 and .69 respectively, both $p < .001$; for the Control group (N=17) the correlation coefficients for the PPT and the PPVT were .71 and .72 respectively, both $p < .001$ (Aaronson & Phillips, 1977).

In our Head Start study, the PPT was administered along with the S-B to 117 children in the Ohio sample. Statistically significant correlation coefficients ($p < .001$) were obtained between the two tests, .62 with the S-B Mental Age score and .42 with the S-B IQ (Table 4).

Comparison of PPT and ABC Inventory. For a Wisconsin Head Start Group (N=27) data were obtained for the PPT used with the ABC Inventory. This inventory is an individually administered paper-and-pencil school readiness test for four-year-olds which yields a Readiness Age, a Total Raw Score, and four subtest scores (Adair & Blesch, 1971). All correlations with the PPT reached significance,

the most impressive ones being .63 (Total ABC Raw Score), .76 (Comprehension subtest) and .72 (Concept Development subtest). See Table 6.

Insert Table 6 about here

Behavioral Data

Teachers' ratings are a recognized criterion employed in validating intelligence tests because such ratings are likely to be heavily colored by the child's scholastic performance (Anastasi, 1961). If not too lengthy and time consuming, such ratings are easily obtainable from staff in Head Start groups. A simple 10-item Classroom Behavior Description (CBD), plus a global rating of Adjustment, was developed by Aaronson and Schaefer (Note 2) based on results of extensive work reported (Schaefer & Aaronson, 1973) on the development of a series of Classroom Behavior Inventories.

The PPT, along with the PPVT, has been used in conjunction with the CBD in a total of three groups, two Head Start programs and one non-Head Start. Our principal analysis has been with this total mixed sample of 116 subjects, as the larger number provides a more substantial basis for comparison of results among

Insert Table 7 about here

the three instruments (Table 7). Additionally, we examined teachers' ratings of three behavior items—Ability, Adjustment and Self Reliant/Self Sufficient—for the Head Start special subgroup (Ns = 37-41) on which we had pre- and post-school year ratings on the PPT and the CBD, and Fall pretest ratings on the PPVT (Table 5). For the total mixed sample, the PPT has correlated well with seven out of 10 of the CBD behavioral items ($p < .005$). The highest value was with the only

cognitive item, "Is able in comprehension and problem-solving;" .57 ($p < .005$), the global rating of Adjustment is also noteworthy, .41 ($p < .005$). For the Head Start special subgroup, the PPT correlations with the pre- and post-school year CBD ratings followed much the same pattern as with the total sample, with the exception of the global rating of adjustment.

Long Range Predictive Power of the Preschool Preposition Test

Probably the most common criterion employed in validating intelligence tests is some index of academic achievement or scholastic aptitude. This type of validity information is especially relevant for tests that attempt to predict scholastic aptitude or that hope to identify areas in which students need some sort of assistance to perform satisfactorily in a school setting. Additionally, information of this nature helps the tester to understand the behavior domain sampled by the test (Anastasi, 1961). It is almost beyond expectation that a brief and simple preschool cognitive screening test would predict mental ability and achievement test scores over a long period of time. The PPT has demonstrated predictive power for a group of Maryland Head Start children over a span of five school years, from four weeks after the start of the Head Start school year to near the close of the third grade school year. The PPVT, administered at the same time to some of the children, lacked the same predictive power.

For this third grade followup study, 54 of the original 118 Maryland Head Start children were located in the school system, but not all test records were obtainable for all of the children. Ten children had no test scores because they were in Special Education classes, which are not tested. Of the remaining 44 children, sample sizes varied from 40 to 44 on test and subtest scores. We were able to locate records on 22 of 37 children in the Head Start special subgroup.

Below we compare ratings on the PPT, the CBD, and the PPVT obtained near the beginning of the Head Start school year with ratings obtained near the close of the third grade on the Cognitive Abilities Test (CAT), a test of mental abilities (Thorndike & Hagen, 1971), and with the Iowa Tests of Basic Skills (ITBS), a measure of academic achievement (Hieronymus & Lindquist, 1971). (See Table 8).

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Insert Table 8 about here

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Cognitive ability predictions. The Head Start PPTs successfully predicted the three subtest scores on the CAT, designated as Verbal, Non-verbal and Quantitative Abilities, at the close of the third grade for 40 to 44 children. The PPT correlated .38 ($p < .01$) with both the Quantitative and Non-verbal Scores of the CAT and attained a value of .23 ($p < .068$) with the Verbal subtest Score, a more tenuous but still acceptable level of significance in light of the great time span (Table 8).

Follow-up data were examined on the subsample of 22 children from the Head Start special subgroup on whom PPVTs had been obtained in the Head Start study. With the smaller N, the PPT still retains significant correlations with the Quantitative and Non-verbal subtests of the CAT but loses an acceptable level of significance with the Verbal subtest. However, it should be noted that the PPVT has a complete lack of correlation with the Verbal subtest, attaining a value of .02 compared to the PPT value of .23. Moreover, the PPVT scores did not reach a level of significance comparable to the PPT with any of the other CAT subtests (Table 9).

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Insert Table 9 about here

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As the PPT is a receptive language test, it came as a surprise that its predictability in the areas of Quantitative and Non-verbal Abilities surpassed the Verbal. We have reasoned that prepositions may have special properties not linked primarily to vocabulary building. Prepositions occur with far greater frequency than most words in the adult vocabulary so that a child hears them all the time (Kucera & Francis, 1970). If they were primarily representative of verbal ability, children would learn them early. However, they do not. Piaget (Gruber & Voneche, 1977) claims that not until about school age does a child come to comprehend such spatial concepts as below and above, left and right, before and behind. Additionally, it can be noted that vocabulary tests for preschool children, designed to reflect their verbal ability, typically are composed of content words, especially nouns. Ability to comprehend the concepts underlying PPT prepositions may proceed concommitantly with developing intellect and with increasing ability to think and reason rather than merely with developing verbal knowledge. This might be the basis for the PPT's impressive performance.

Academic achievement predictions. With the Composite (total) score on the ITBS (N=40), the Head Start PPT scores achieved a correlation coefficient of .41 ($p < .005$), a most impressive correlation considering the span of five school years that it reflects. The ITBS has five subtests, three of which are further divided into parts which are given separate scores. The PPT achieved significant correlations with almost all the separate scores (Ns = 40–44). Most noteworthy are a correlation of .29 ($p < .05$) for Vocabulary, .27 ($p < .05$) for Reading Comprehension, .38 ($p < .01$) for Mathematical Concepts and .26 ($p < .05$) for Mathematics Problem Solving (Table 8).

For 22 children on whom PPVTs had been obtained in our Head Start special subgroup, the PPT score achieved a correlation coefficient of .47 ($p < .025$) with the Composite Score of the five subtests, .44 ($p < .05$) with Mathematical Concepts,

and .49 ($p < .025$) with Mathematical Problem Solving (Table 9). PPVT scores did not reach comparable levels of statistical significance in these areas. Although neither the PPT nor the PPVT achieved significant correlations with Vocabulary or with Reading Comprehension, in absolute value the PPT correlations were 16 points and 49 points higher respectively. It seems odd that the PPVT had negative correlations with these items.

Classroom behavior predictions. At the time the PPT was administered to the Maryland Head Start children, they were also rated on the CBD by their teachers in 10 classes in six different schools. Teachers' ratings were added to the testing program to provide a validation criterion for the PPT. Now we were curious to learn if CBD Item 10 "Is able in comprehension and problem-solving", which had earned the highest correlation value of any of the CBD items with the PPT in Head Start, would have predictive value in relation to the third grade CAT and ITBS scores of the children. The data do demonstrate the predictive power of Item 10, thus supporting its initial use as a measure of validity for the PPT (Table 8). For the 54 children in the follow-up study the initial correlation coefficient between the PPT and Item 10 of the CBD had been .51 ($p < .005$). Of the children who were tested (Ns=40–44), for the three subtests of the CAT, Item 10 correlated with the Verbal subtest .32 ($p < .05$), Quantitative subtest .41 ($p < .005$), and Non-verbal subtest .45 ($p < .005$). With the ITBS, Item 10 correlated with Vocabulary .31 ($p < .05$), Reading Comprehension .31 ($p < .05$), Mathematical Concepts .26 ($p < .05$), Mathematics Problem Solving .24 ($p < .07$), and with the ITBS Composite Score .44 ($p < .005$).

In the special subgroup, for the 22 children with PPVT scores, Item 10 of the CBD correlated equally with the original Head Start PPT (.73) and the PPVT Raw Score (.71), both significant at the $< .005$ level. For the third grade tests, Item 10 correlated .30 and .32 with the CAT Quantitative and Non-verbal subtests respectively ($p < .10$) but, like the PPT and PPVT, failed to reach an acceptable significance level with the Verbal subtest. With the ITBS, the noteworthy correlation coefficients were with Mathematical Concepts (.36) and with the ITBS

Composite Score (.35), $p < .10$. It should be noted that although the predictive power of CBD Item 10 for third grade test performance lagged behind that of the PPT, it was superior to that of the PPVT (Table 9).

Predictions related to special education students. Ten Special Education students were, by policy, excluded from the third grade testing program. It was found by inspection of the individual PPT protocols that nine out of 10 of the Special Education students could have been identified at Head Start age, on the basis of their PPT scores, as needing further evaluation and perhaps special assistance. Their scores were in the lowest third of the PPT normative tables, five placing at or below the 11th percentile, and three at or below the first percentile. Additionally, we compared their mean Head Start PPT scores and teachers' ratings of CBD Item 10, "Is Able in Comprehension and Problem Solving," with those of the 44 children who were assigned to regular classes and found that Special Education students earned significantly lower scores (Table 10).

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Insert Table 10 about here

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The Special Education students, as rated on the CBD by their Head Start teachers, had many more behavior difficulties at about age four than the regular students. They scored significantly less than the regular students on items Considerate/Kind, Conforming/Obedient, Attentive/Persevering, Self-reliant/Self-sufficient, and Adjustment; they scored higher on items Distractible/Hyperactive and Dependent/Wanting Help (Table 11).

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Insert Table 11 about here

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## Parent-Child Relationships

Of interest for Head Start programs is a possible link between PPT scores and the mother's nurturant and verbal behavior with her child. Research indicates that the PPT may have the ability to identify families in which the primary caretaker is relatively non-verbal and non-nurturant with the child. In a previous study of 28 low socio-economic status three-year-old males in a home-based child-focussed intervention program in Washington, D.C., the PPT scores correlated significantly with the quality of the mother-child interactions during the tutoring sessions (Schaefer & Aaronson, Note 3). Those children whose mothers were rated as hostile or ignoring and relatively non-verbal with the child typically earned the poorest scores on the PPT, but not on the PPVT. In a second study of 23 low socio-economic status boys and girls, ages 40-54 months, in a home-based parent-focussed intervention program in Freeport, New York, maternal behavior ratings of nurturance and verbal interaction with the child on the PACT (Levenstein, Note 4) produced significant correlations with the PPT, but not with the PPVT and, with one exception, not with the S-B. In both of these projects the PPT scores correlated highly with the PPVT and S-B test scores, but the latter two instruments did not have the discriminatory power of the PPT in the area of parent-child relationships (Aaronson & Phillips, 1977).

An additional sample of 21 boys and girls, ages 42-53 months, has been obtained from the Freeport project (Table 12). The PPT score at age four

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Insert Table 12 about here

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correlated significantly with the PACT rating at age two of the parents' verbal interaction total subscale score (.45, $p < .05$) and with the PACT nurturance item "Verbalizes affection to child" (.39, $p < .10$). However, when the ratings were repeated at age four when the PPT was administered, they were not statistically

significant. Additionally, the PPT correlation with the parents' nurturance total subscale score, while not reaching significance, was 16 points higher in value at age two than age four. In this particular sample, it appears that maternal behavior at the earlier age had more bearing on later PPT performance than later maternal behavior. Further investigations of the relationship between PPT scores and mother-child interactions are being sought because of the promise they hold for improving children's academic performance through upgrading the quality of parent-child relationships.

## Conclusions

As a preschool screening instrument, the PPT can play an important role in the early identification of cognitive delay. PPT scores increase appropriately with chronological age. Cognitive data demonstrate impressive correlations with recognized intelligence tests, for example the Stanford-Binet and the Peabody Picture Vocabulary Test. The PPT correlates well with teachers' ratings related to classroom performance. It has concurrent validity as a test of receptive language ability and predictive validity in areas designated as Verbal, Non-verbal and Quantitative Abilities on a test of cognitive abilities. The long term predictive power demonstrated over a period of five school years in a third grade follow-up study of students from 10 Head Start classes is considered strong and unexpected in so brief and simple a screening tool. Of interest for Head Start programs, a possible link between PPT scores and the mother's nurturant and verbal behavior with her child is indicated from reports of parent-child relationships in three home-based intervention studies.

Conclusions based on the investigation of five Head Start programs and one third grade follow-up study are that administering the PPT a few weeks after the beginning of the school year provides useful identifying information about students likely to encounter scholastic difficulties. The PPT can be administered quickly,

easily, and inexpensively by classroom staff or volunteers. Children earning the poorest scores can be assessed further to determine the underlying causes. Special needs can then be met early in the preschool year, helping students to ameliorate or overcome emerging difficulties which could develop later on into scholastically handicapping conditions.

## Reference Notes

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FIGURE 1

CHILDREN IN HEAD START SAMPLES AND THOSE IN NON-HEAD START COMPARED FOR MEAN PPT SCORES BY SIX-MONTH AGE GROUPINGS

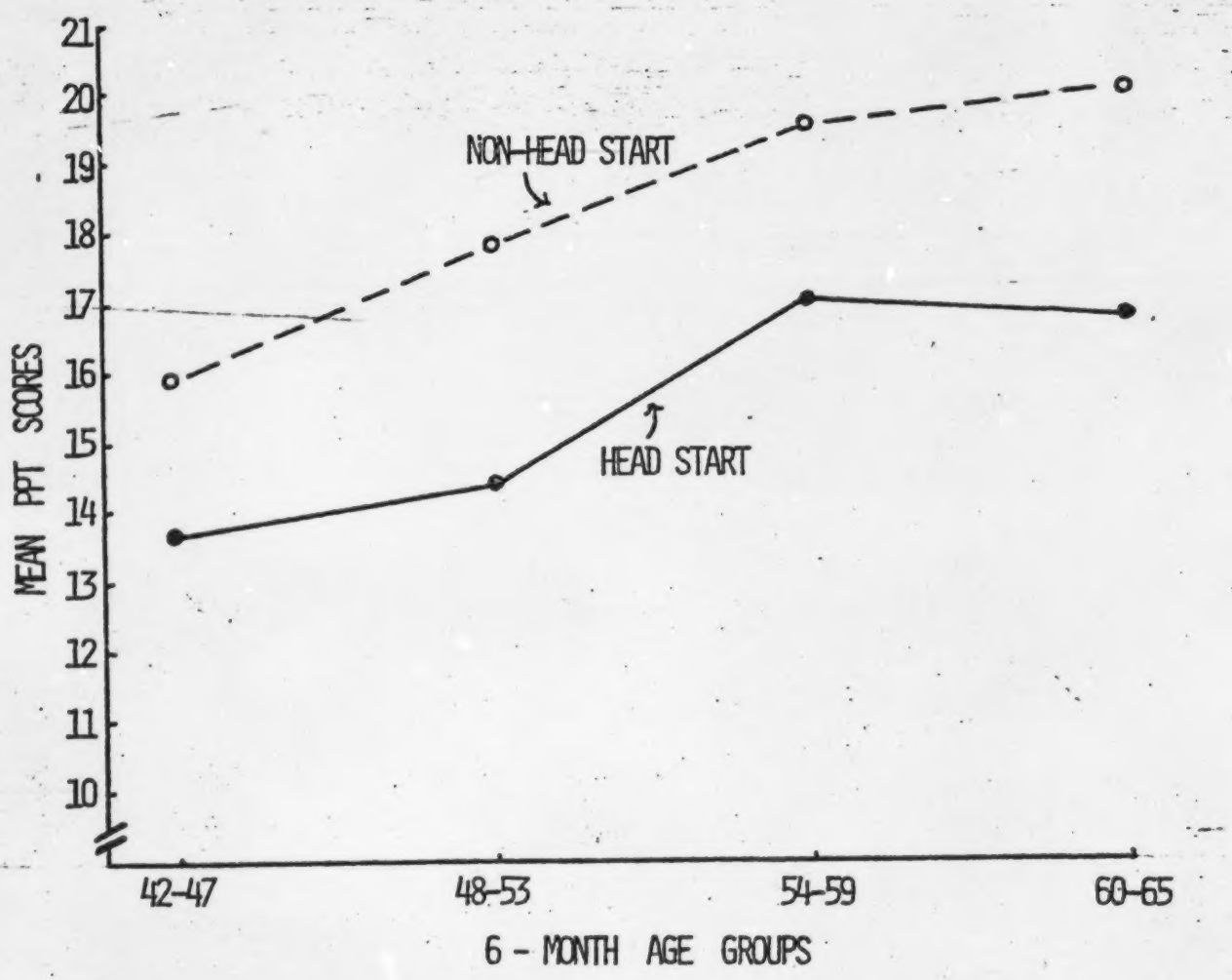

TABLE 1

DESCRIPTION OF PRESCHOOL PREPOSITION TEST HEAD START SAMPLE

| Subsample | Number of Subjects | Area: Urban Suburban Rural | Race: Black White | Age in Months | Auxiliary Data |
|---|---|---|---|---|---|
| 1. Maryland | 81 | S & R | B & W | 42-65 | Classroom Behavior Description, Cognitive Abilities Test, Iowa Tests of Basic Skills |
| 2. Maryland special subgroup | 37 | S & R | B & W | 42-59 | Peabody Picture Vocabulary Test, Classroom Behavior Description, CAT and ITBS |
| 3. Kansas | 28 | U | B & W | 30-65 | None |
| 4. Ohio | 125 | S & R | B & W | 42-68 | Peabody Picture Vocabulary Test, Stanford-Binet |
| 5. Wisconsin | 28 | R | W | 39-66 | ABC Inventory (school readiness) - 4 subtests and total score |

Total N = 299

TABLE 2

ANALYSIS OF DISTRIBUTION[1] FOR SKEWNESS AND KURTOSIS
BY SIX MONTH AGE INTERVALS
FROM 24 - 71 MONTHS

N = 922

| Age Group | N | $\bar{X}$ | S.D. | Skewness Coefficient[2] | Kurtosis Coefficient[3] |
|---|---|---|---|---|---|
| 24 - 29 | 30 | 7.83 | 3.63 | .34 | 1.88 |
| 30 - 35 | 67 | 12.09 | 4.37 | -.24 | 2.45 |
| 36 - 41 | 139 | 13.94 | 3.73 | .05 | 2.19 |
| 42 - 47 | 113 | 15.48 | 4.10 | -.39 | 2.55 |
| 48 - 53 | 168 | 16.71 | 4.11 | -.74 | 3.06 |
| 54 - 59 | 192 | 18.99 | 3.16 | -1.49 | 6.11 |
| 60 - 65 | 147 | 20.17 | 2.65 | -2.33 | 12.02 |
| 66 - 71 | 66 | 19.55 | 2.81 | -.85 | 3.26 |

[1]Excluded are institutionalized, homeless children, moderately and severely emotionally disturbed, and mentally retarded children.

[2]Skew for normal distribution should be 0.

[3]Kurtosis for normal distribution should be 3.

TABLE 3

Five Head Start Samples Combined
Intercorrelations of PPT with Age in Months and with PPVT

| Variable | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Age in Months (N=297) | — | | | | |
| PPT (N=297) | .29* | — | | | |
| PPVT Raw (N=106) | .45* | .55* | — | | |
| PPVT IQ (N=106) | .07 | .51* | .89* | — | |
| PPVT M.A. (N=106) | .45* | .53* | .98* | .88* | — |

* $p < .01$

TABLE 4

Correlation Matrix of Age, PPT,
PPVT and S-B for Ohio Head Start Sample

| | Age 1 | PPT 2 | Peabody Raw 3 | Peabody IQ 4 | S-B IQ 5 | S-B M.A. 6 |
|---|---|---|---|---|---|---|
| 1. Age (N=125) | — | | | | | |
| 2. PPT (N=125) | .33* | — | | | | |
| 3. Peabody Raw (N=65) | .46* | .47* | — | | | |
| 4. Peabody IQ (N=65) | .06 | .41* | .89* | — | | |
| 5. S-B IQ (N=117) | .24* | .42* | .37* | .57* | — | |
| 6. S-B M.A. (N=117) | .51* | .62* | .68* | .52* | .69* | — |

* $p < .001$

TABLE 5

MARYLAND HEAD START SPECIAL SUBGROUP

Intercorrelations of Pretest (Fall) and Posttest (Spring) Scores on PPT with Age, PPVT Scores and Teachers' Ratings on the Classroom Behavior Description

| Variable | Fall Pretest Scores 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Spring Posttest Scores 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fall Testing:** | | | | | | | | | | | | | |
| 1. Age (months) | — | | | | | | | | | | | | |
| 2. PPT Test Score | .20 | — | | | | | | | | | | | |
| 3. PPVT Raw Score | .26 | .68** | — | | | | | | | | | | |
| 4. PPVT IQ | -.06 | .65** | .91** | — | | | | | | | | | |
| 5. PPVT M.A. | .29 | .67** | .98** | .91** | — | | | | | | | | |
| 6. Self-reliant Self-sufficient | .04 | .36* | .42** | .37* | .38* | — | | | | | | | |
| 7. Able in Comprehension & Problem Solving | .18 | .51** | .50** | .43** | .44** | .64** | — | | | | | | |
| 8. Adjustment | .20 | .43** | .23 | .16 | .20 | .51** | .64** | — | | | | | |
| **Spring Testing** | | | | | | | | | | | | | |
| 9. Age (months) | .98** | .21 | .22 | -.11 | .26 | .01 | .12 | .23 | — | | | | |
| 10. PPT Test Score | -.02 | .64** | .46** | .45** | .40* | .49** | .56** | .36* | -.06 | — | | | |
| 11. Self-reliant Self-sufficient | .23 | .48** | .37* | .23 | .33* | .56** | .65** | .71** | .24 | .58** | — | | |
| 12. Able in Comprehension & Problem Solving | .02 | .47** | .26 | .19 | .20 | .35* | .52** | .55** | -.0 | .55** | .67** | — | |
| 13. Adjustment | -.22 | .07 | -.06 | .01 | -.08 | .01 | .27 | .32 | -.21 | .12 | .37* | .41* | — |

*p < .05, **p < .01 (Two-tailed test)  N = 41 for Pretest, 37 for Posttest

Note: PPT = Preschool Preposition Test
PPVT = Peabody Picture Vocabulary Test
Only key words are used here for Classroom Behavior Description items.

TABLE 6

Correlation Matrix of Age, PPT, and ABC Inventory
for Wisconsin Head Start Group

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Age in Months | — | | | | | | | |
| 2. PPT Score | -.06 | — | | | | | | |
| 3. ABC Readiness Age | .32 | .60** | — | | | | | |
| 4. ABC Total Raw Score | .31 | .63** | .99** | — | | | | |
| 5. ABC Draw-A-Man | .34 | .42* | .89** | .88** | — | | | |
| 6. ABC Comprehension | .07 | .76** | .77** | .80** | .55** | — | | |
| 7. ABC Concept Development | .21 | .72** | .65** | .65** | .42* | .60** | — | |
| 8. ABC Visual-Motor | .23 | .43* | .76** | .78** | .46* | .61** | .44* | — |

*p < .05
**p < .01

N = 27

TABLE 7

CORRELATION MATRIX FOR PRESCHOOL PREPOSITION TEST, PEABODY PICTURE VOCABULARY TEST & CLASSROOM BEHAVIOR DESCRIPTION[1] FOR MIXED SAMPLE OF ONE NON-HEAD START AND TWO HEAD START GROUPS

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Preschool Prep. Test Score | 1 | | | | | | | | | | | | | | |
| 2. PPVT Raw Score | .72* | 1 | | | | | | | | | | | | | |
| 3. PPVT IQ | .30* | .47* | 1 | | | | | | | | | | | | |
| 4. PPVT Mental Age | .69* | .97* | .48* | 1 | | | | | | | | | | | |
| 5. Considerate Kind | .36* | .31* | .30* | .26* | 1 | | | | | | | | | | |
| 6. Distractible Hyperactive | -.47* | -.42* | -.15 | -.38* | -.36* | 1 | | | | | | | | | |
| 7. Conforming Obedient | .21 | .16 | -.10 | .12 | .41* | -.54* | 1 | | | | | | | | |
| 8. Attentive Persevering | .55* | .46* | .21 | .42* | .54* | -.71* | .48* | 1 | | | | | | | |
| 9. Gregarious Expressive | .33* | .41* | .24 | .37* | .41* | -.25 | .10 | .44* | 1 | | | | | | |
| 10. Belligerent Irritable | -.06 | -.06 | .07 | -.08 | -.36* | .37* | -.46* | -.34* | .08 | 1 | | | | | |
| 11. Withdrawn Solitary | -.16 | -.30 | -.19 | -.28* | -.15 | .07 | .11 | -.22 | -.73* | .18 | 1 | | | | |
| 12. Self-reliant Self-sufficient | .49* | .51* | .20 | .49* | .29* | -.35* | .11 | .50* | .57* | -.11 | -.46* | 1 | | | |
| 13. Dependent Wants help | -.32* | -.30* | -.11 | -.29* | -.20 | .28* | -.11 | -.38* | -.42* | .15 | .35* | -.75* | 1 | | |
| 14. Able in Comprehension & Problem Solving | .57* | .58* | .37* | .54* | .45* | -.47* | .26* | .66* | .63* | -.17 | -.48* | .68* | -.45* | 1 | |
| 15. Adjustment | .41* | .34* | .37* | .29* | .49* | -.42* | .30* | .54* | .47* | -.32* | -.34* | .51* | -.47* | .63* | 1 |

*p <.005 (Two-tailed test) N=122 for Variables 1-4; 116 for Variables 5-15

[1]Only key words are used here for Classroom Behavior Description items.

TABLE 8

THIRD GRADE FOLLOW-UP—MARYLAND HEAD START PROGRAM
(Full Sample)

INTERCORRELATIONS OF PPTs AND TEACHERS' RATINGS NEAR BEGINNING OF HEAD START SCHOOL YEAR WITH CLOSE OF THIRD GRADE CAT* AND ITBS** SCORES

| | | Preschool Measures: | | | |
|---|---|---|---|---|---|
| Variable | N | Correlation with PPT | Level of Signif. | Correlation w/CBD "Able" | Level o Signif. |
| eschool Measures: | | | | | |
| PPT | 54 | — | — | | |
| CBD "Able" | 54 | .51 | <.005 | — | — |
| ird Grade Measures: | | | | | |
| CAT – 3 Subtests | | | | | |
| I. Verbal | 43 | .23 | .068 | .32 | <.05 |
| II. Quant. | 43 | .38 | <.01 | .41 | <.005 |
| III. N-Verbal | 43 | .38 | <.01 | .45 | <.005 |
| ITBS – 5 Subtests | | | | | |
| I. Vocabulary | 44 | .29 | <.05 | .31 | <.05 |
| II. Reading Comprehension | 44 | .27 | <.05 | .31 | <.05 |
| III. Language Skills | | | | | |
| Spelling | 43 | .23 | .068 | .29 | <.05 |
| Capit. | 44 | .17 | | .23 | .076 |
| Punctuation | 43 | .18 | | .21 | .093 |
| Usage | 42 | .15 | | .26 | <.05 |
| IV. Work-Study Skills | | | | | |
| Map reading | 40 | .31 | <.05 | .35 | <.05 |
| Graphs | 41 | .37 | <.01 | .38 | <.01 |
| Reference use | 40 | .30 | <.05 | .44 | <.005 |
| V. Mathematics Skills | | | | | |
| Math. concepts | 43 | .38 | <.01 | .26 | <.05 |
| Problem solving | 43 | .26 | <.05 | .24 | <.07 |
| ITBS Composite Score of 5 Subtests | 40 | .41 | <.005 | .44 | <.005 |

Significant levels are for one tailed test.

Meaning of Abbreviations: CAT—Cognitive Abilities Test; ITBS—Iowa Test of Basic Skills; CBD "Able"—Classroom Behavior Description item "Is able in comprehension and problem solving;" Graphs—Reading graphs and tables; Reference use—Knowledge and use of reference materials; Problem solving—Mathematics problem solving.

TABLE 9

THIRD GRADE FOLLOW-UP—MARYLAND HEAD START PROGRAM
(Subsample having PPVTs)

INTERCORRELATIONS OF PPTs, PPVTs, AND TEACHERS' RATINGS NEAR BEGINNING OF HEAD START SCHOOL YEAR WITH END OF THIRD GRADE CAT* AND ITBS** SCORES

| | | Preschool Measures: | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | N | Corr. w/PPT | Level of Signif. | Corr. w/CBD "Able" | Level of Signif. | Corr. w/PPVT Raw | Level of Signif. | Corr. w/PPVT IQ | Level of Signif. |
| **Preschool Measures:** | | | | | | | | | |
| PPT | 22 | — | — | | | | | | |
| CBD "Able" | 22 | .73 | <.005 | — | — | | | | |
| PPVT Raw | 22 | .72 | <.005 | .71 | <.005 | — | — | | |
| PPVT IQ | 22 | .61 | <.005 | .59 | <.005 | .88 | <.005 | — | — |
| **Third Grade Measures:** | | | | | | | | | |
| CAT - 3 Subtests | | | | | | | | | |
| I. Verbal | 20 | .23 | | .28 | | .02 | | .17 | |
| II. Quant. | 20 | .40 | <.05 | .30 | <.10 | .28 | | .32 | <.10 |
| III. Non-Verbal | 20 | .33 | <.10 | .32 | <.10 | .26 | | .26 | |
| ITBS - 5 Subtests | | | | | | | | | |
| I. Vocabulary | 20 | .11 | | .15 | | -.05 | | .10 | |
| II. Reading Compre. | 20 | .26 | | .19 | | -.23 | | -.15 | |
| III. Language Skills | | | | | | | | | |
| Spelling | 20 | .49 | <.025 | .43 | <.05 | .31 | <.10 | .32 | <.10 |
| Capitalization | 20 | .38 | <.05 | .28 | | .13 | | .10 | |
| Punctuation | 20 | .25 | | .16 | | .22 | | .31 | <.10 |
| Language use | 20 | .24 | | .30 | <.10 | -.18 | | -.08 | |
| IV. Work-Study Skills | | | | | | | | | |
| Map reading | 19 | .39 | <.05 | .46 | <.025 | .18 | | .22 | |
| Graphs | 19 | .55 | <.01 | .60 | <.005 | .54 | <.01 | .58 | <.005 |
| Reference use | 19 | .55 | <.01 | .40 | <.25 | .41 | <.05 | .54 | <.01 |
| V. Mathematics Skills | | | | | | | | | |
| Math concepts | 20 | .44 | <.05 | .36 | <.10 | .32 | <.10 | .25 | |
| Problem solving | 20 | .49 | <.025 | .26 | | .20 | | .08 | |
| ITBS Composite Score of 5 Subtests | 19 | .47 | <.025 | .35 | <.10 | .23 | | .32 | <.10 |

*CAT - Cognitive Abilities Test
**ITBS - Iowa Test of Basic Skills
See Meaning of Abbreviations - Table 8
Significance levels are for one tailed test.

TABLE 10

THIRD GRADE FOLLOW-UP--MARYLAND HEAD START PROGRAM

Children in Special Education Classes and Those in Regular Third Grade Classes Compared on Original Fall Head Start PPT Scores and Teachers' Rating of Ability*

| Variable | N | Mean | S.D. | t test | Level of Significance |
|---|---|---|---|---|---|
| PPT Score Special Ed. | 10 | 11.20 | 4.58 | 3.39 | <.01 |
| PPT Score Non-Special Ed. | 44 | 15.91 | 3.82 | | |
| Teachers' Rating of Ability Special Ed. | 10 | 2.4 | .80 | 3.82 | <.01 |
| Teachers' Rating of Ability Non-Special Ed. | 44 | 3.27 | .62 | | |

*Item 10, Classroom Behavior Description—
"Is Able in Comprehension and Problem Solving"

TABLE 11

THIRD GRADE FOLLOW-UP--MARYLAND HEAD START PROGRAM

Children in Special Education Classes and Those in Regular Classes Compared on Teachers' Ratings of Classroom Behavior Description Items[1]

| CBD Item | Special Ed. N - 10 Mean | S.D. | Non-Special Ed. N - 44 Mean | S.D. | t test | Level of Significance |
|---|---|---|---|---|---|---|
| 1. Considerate Kind | 2.9 | .57 | 3.4 | .79 | 2.01 | <.05 |
| 2. Distractible Hyperactive | 2.6 | 1.17 | 1.8 | .95 | 2.25 | <.05 |
| 3. Conforming Obedient | 2.7 | .67 | 3.4 | .84 | 2.48 | <.02 |
| 4. Attentive Persevering | 2.3 | .82 | 3.2 | .74 | 3.50 | <.01 |
| 5. Gregarious Expressive | 2.6 | .84 | 3.0 | .79 | 1.51 | * |
| 6. Belligerent Irritable | 1.9 | 1.20 | 1.6 | .90 | .922 | * |
| 7. Withdrawn Solitary | 1.4 | .97 | 1.8 | .81 | 1.19 | * |
| 8. Self-reliant Self-sufficient | 2.4 | .84 | 3.3 | .67 | 3.71 | <.01 |
| 9. Dependent Wants help | 2.5 | .71 | 1.8 | .69 | 3.10 | <.01 |
| 10. Able in Comprehension and Problem Solving | 2.4 | .84 | 3.3 | .62 | 3.73 | <.01 |
| 11. Adjustment | 1.9 | .57 | 3.3 | .83 | 5.13 | <.01 |

*$p > .10$

[1]Only key words are used here for Classroom Behavior Description items.

TABLE 12

MATERNAL BEHAVIOR RATINGS
Freeport, N.Y. Project - 1975 Sample

Correlations between Scores on Two Cognitive Tests and Selected Subscales and Items of Levenstein's PACT (Parent and Child Together)

| Variable | Preschool Preposition Test (1977) | Stanford-Binet IQ (1977) | Stanford Binet Mental Age (1977) |
|---|---|---|---|
| 1. Preschool Preposition Test | ---- | | |
| 2. Stanford-Binet IQ | .66*** | ---- | |
| 3. Stanford-Binet Mental Age | .69*** | .91*** | ---- |
| 4. Parents' Verbal Interaction Total Subscale Score (1975) | .45** | .39* | .58*** |
| 5. Parents' Nurturance Total Subscale Score (1975) | .20 | .20 | .28 |
| 6. Nurturance Item 2, "Verbalizes Affection to Child" (1975) | .39* | .29 | .43* |
| 7. Parents' Verbal Interaction Total Subscale Score (1977) | .17 | .57** | .51** |
| 8. Parents' Nurturance Total Subscale Score (1977) | .04 | .13 | .20 |
| 9. Nurturance Item 2, "Verbalizes Affection to Child" (1977) | -.03 | .00 | .13 |

*p <.10 (two-tailed test)
**p <.05
***p <.01

N = 21 for Variables 1-6
N = 18 for Variables 7-9